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THE HOMOGENEITY REGIONS OF THE SUPERCONDUCTIVE PHASES IN THE MOLYBDENUM-PLATINUM SYSTEM

R. Flukiger et al

Translation of "Les Domaines d'Homogeneite des Phases Supraconductrices dans le Systeme Molybdene-Platine," Journal of Less Common Metals, Vol. 32, No. 2, August 1973, pp. 222 224
(Selected Pages Only)

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16. Abstract

The superconductivity temperatures of ordered and disordered structures are discussed. Tests conducted show that the measurement of T_c after hardening makes it possible to determine the annealing temperature within +20°C. This property is observed in other hexagonal phases based on Mo and W, which also undergo an order-disorder transformation.

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TABLE III /223*

Comparison of Superconductive Temperatures of Ordered and Disordered Structures

Alloy	Structure	T_c (°K)	Ref.
$Mo_{0.50}Ir_{0.50}$	A3	1.5	7
	B19	8.8	7
$Mo_{0.69}Pt_{0.31}$	A3	Probably not observed $\leqslant 1.2$	
	DO_{19}	7.8	
$Nb_{0.75}Au_{0.25}$	A2	1.2	21,22
	A15	11.4	21,23
$V_{0.75}Au_{0.25}$	A2	<0.3	21
	A15	3.0-3.2	11,21

Superconductivity and Microhardness

Stephens et al [18]# recently published microhardness measurements for solid solutions of the Mo-Re to Mo-Pt systems. Figure 11 shows the variation in hardness compared with that of the critical temperature in the same α phase. Obviously, T_c does not depend, in the first place, on electron concentration, /224 but appears to be affected by the atomic properties of the solute. Conversely, if reference is made to the same number of electrons per atom, there seems to be a correlation [24] between T_c and H_v. Certain arguments lead to the conclusion that an inverse

* Pagination in the margin refers to page numbers in the foreign text.
# Translator's Note: References were not translated.

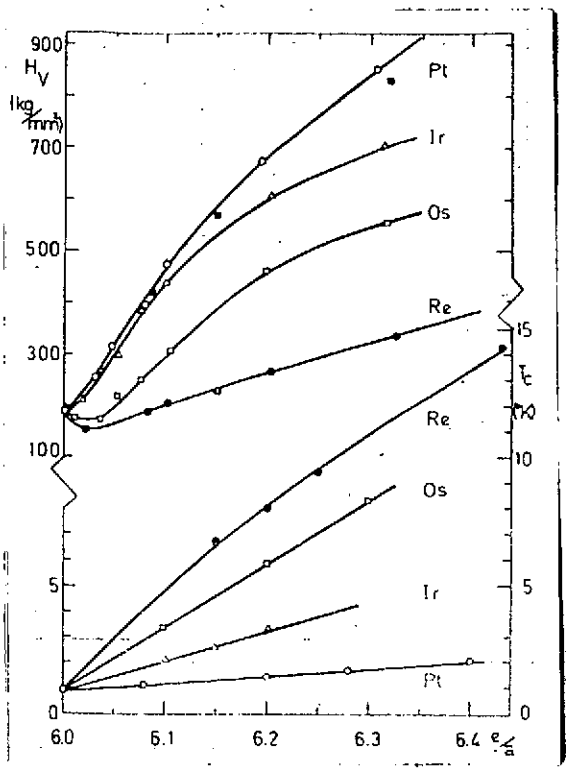

Fig. 11. Superconductivity and microhardness in solid solutions of the Mo-Re, Mo-Os, Mo-Ir and Mo-Pt systems.

relation between these magnitudes is normal although it is doubtful whether microhardness reflects, in a simple manner, characteristics linked to the electron structure or to the phonon spectrum.

Conclusion

The correct allocation of the superconductive temperature to different phases of the Mo-Pt system has involved certain modifications in the homogeneity regions given by Ocken et al [6], the most important of which concerns the two hexagonal phases ε (disordered) and ε' (semi-ordered Ni_3Sn type), where the ε phase attains the solidification temperature at 2080°C, while the ε' phase is formed by a peritectic-like reaction at 1880°C. The variation of the limit of homogeneity of this phase with temperature is responsible for the change in the superconductive temperature, which was allocated by mistake to the A15[7,8] phase.

An interesting result is provided by the fact that the Mo-Pt alloys retain the state corresponding to the heat treatment to which they have been exposed on condition that the cooling speed is not slower than the one at the time of radiation "hardening." A number of tests, conducted with an alloy having the approximate composition $Mo_{0.70}Pt_{0.30}$, showed that the measurement of T_c made after such a hardening makes it possible to determine, a posteriori, the annealing temperature with an accuracy of ±20°C in the

temperature region ranging from 1600 to ~ 1880°C, where the total variation of T_c is 3°K (Fig. 5).

This property was observed in other hexagonal phases based on Mo and on W, which also undergo an order-disorder transformation [16]. The results will appear shortly.

Appreciation

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